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Grease Lubrication from the Consumers' Point of View

By Dr. Wm. H. Parche,
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(Continued from February Issue)

Another obstacle to satisfactory lubrication is the abuse to which lubricants are subjected in many plants by faulty storage and handling. It must be remembered that greases are made up of a complex system of highly reactive hydrocarbons which are chemically stable only under proper conditions. The utmost care is required to prevent a change in their characteristics. Excessive temperatures are detrimental and often destructive; moisture is chemically a disadvantage; and cleanliness requires no comment. A contaminated grease only acts as a destructive compound in any bearing as should be self evident when one considers the very close tolerances and clearances in antifriction bearing types which are gaged in millionths of an inch. Improper storage and handling of grease is responsible for many complaints directly attributable to the user whose lubrication department is not properly organized.

The Value of Lubrication Engineering

It is not surprising that there is a lack of knowledge on the part of management as to what constitutes lubrication engineering. One needs but to study the work of Norton (16) and Hersey (1) to appreciate how recently the subject has been treated scientifically. In fact the real technical development is covered in the amazingly short period of the last two decades. To many well meaning and otherwise progressive executives, the lubrication engineer is a species of glorified oiler.

The practical experience which enables one to interpret the various results of an investigation into the chemical and physical reactions is largely a matter of scientific association with these problems under many conditions of industrial production and service requirements. J. R. Muenger, in his preface to Norton's book, remarks, as recently as 1942, that most engineers are not familiar with the basic theory and principles of lubrication. (16) Here is the crux of the whole situation so far as plant lubrication and consumer cooperation with the producer is concerned.

Obviously, the consumer needs a better understanding of the factors involved and here the lubrication engineer can help him. The various phases of lubrication engineering were recently defined by Everitt (17). As he has pointed out, the purchasing of lubricants is the province of the purchasing agent in accordance with the selection and specifications made by the lubrication engineer. The lubrication engineer should review all new equipment and recommended changes in bearing specification for more efficient operation and service. In fact, wherever frictional control or viscous flow is involved, as in all mechanical assemblies and hydraulic layouts, the plant organization will be well repaid for the cooperative efforts of the lubrication consultant. The proper application of lubrication engineering principles will show incredible savings in maintenance costs and production time losses.

One bearing problem, the solution of which resulted in a saving of over $8,000 a year for replacement alone, is a minor instance compared with other cases in plants where the solution of the problem was put to the lubrication specialist. This instance is particularly appropriate because this was a case where grease was substituted for oil.

Frequently the drive assembly causes failure of bearings by unbalanced conditions of torque, power factors, vibration, careless setting of sheaves, fly wheels, misalignments, etc. A belt improperly applied may cost hundreds of dollars annually. (18)

One more example will suffice. A pump designed for gas failed every six to ten weeks and was condemned as inefficient. Each factory repair cost approximately $25.00 and production time losses were considerable as well as maintenance labor. The bearings, grease lubricated, were considered too small, and housings were badly damaged as a result of upset rotors. The redesign of drives and stabilization of frames under the direction of the lubrication engineer stabilized the assembly and cut down vibration, solving the problem. A repaired pump was installed and has given required service without vibration for nearly a year and appears to be permanent. The reserve pumps, which it had been thought previously were necessary to keep on hand, were stored for use elsewhere.

Here again, bearings and lubrication were considered unsatisfactory and several unwarranted changes had been effected before the matter was referred to the lubrication engineer. The saving amounted to at least

$200 a year in factory repairs, plus two reserve pumps at $40.00 each. The maintenance labor of approximately $250.00, plus production time losses, gives a probable total saving of around $800 to $1000 per year in this minor demonstration.

Another advantage available through the services of a lubrication engineer is constant contact with experimental work in progress throughout the machine tool and lubricant industries. For instance, a new and as yet unannounced bearing design involving adjustment of the design and lubricant, came from one of the leading research directors in the steel industry as a result of investigations being carried out. This work will produce dividends for the company concerned in excess of the annual cost of his employment and it is but one of many such instances.

The lubricant producers have been alert to the need for scientific personnel, and have attempted to fill the lack by sending out technical men in an advisory capacity. But though he may be helpful particularly to the small consumer organization, the technical adviser can only point the way. He cannot always solve the problem entirely because he is not familiar with the actual operating conditions; the consumer hesitates to give full details of his difficulties to an outsider; the adviser cannot follow the solution of the problem over a long enough period of time, and he cannot be entirely impartial.

THE LUBRICATING ORGANIZATION

If the consumer is to obtain the results normally expected, great care must be exercised in the organization of a practical lubrication department. The principal difficulty arises from the scarcity of competent engineers and the tendency to fear radical reorganization changes.

When bearings are overloaded with grease and products are lost by contamination with oil, motor windings are destroyed by lubricants expelled through broken down seals, and accident hazards are brought about by greasy floors and dirty conditions, the fault is poor lubrication organization for which management is to blame. Untrained or poorly trained men are incapable of responsibility and, as a rule, have no desire to accept its demand.

The automotive industry, with a consumer public largely ignorant of mechanics, has met this difficulty with considerable success by standardization and service organizations. The refiners service stations also provide a similar function with admirable results. To a small extent many of the machine tool manufacturers have attempted to follow suit, but unfortunately their machines cannot as a rule be sent to service stations for trained inspectors and factory mechanics to overhaul.

The machine tool industry is now doing a great deal of cooperative research with the refiners and grease technologists in an effort to give the consumer mechanical assemblies as free as possible from the destructive operational practices of indifferent workers. But the consumer continues to exhibit a naive attitude of trust in the advertised efficiency of his machine with little or no consideration of the human equation involved in its operation or of local plant conditions which must modify the fundamental design.

In most plants, away out in back, there is a dirty, greasy, and more or less unimportant individual, the oiler, who is your ultimate consumer. He is too often the arbiter of the fate of your greases. Many years of experience in his particular plant, with no other background, gives him a degree of familiarity with the process of oiling and greasing. In some plants, those employees not wanted by any other department are sent to the oiling gang. Their main qualification is that they can squirt oil from a can, though indifferently. This is your old time "grease monkey." He is at the bottom of the ladder, the poorest paid and the least necessary employee, supposedly the easiest to replace.

Obviously, in the last analysis, the ultimate consumer is the man on the job, in whose hands all practical results are held for better or for worse. There is but one answer. Raise the standards of the oiler, improve supervision and place the responsibility with competent lubrication foremen. One corporation promotes experienced millwrights, who show a desire to assume responsibility, to the lubricating organization with a suitable title and remuneration. Others have schools and training courses and the foremen are men of intelligence with a capacity for the type of work which the situation demands. The number of instances is increasing.

This organization work is not easy, as personnel directors and all departments concerned will find. The complications arising out of readjustments in wages, work regulation, along with established concepts of labor relations are many and frequently difficult to work out, but until they are, the oiler will continue to be inefficient and irresponsible as in the past. (19)

The grease monkey must be replaced by a self-respecting service man, a technician in the senior sense of the word, whose morale will be high as a result of his own self-developed distinction. Without these prerequisites, many of the details upon which good lubricant control rests, will be neglected as so much unnecessary idealism.

SUMMARY

To sum up, the consumer's desire for low cost maintenance can only be realized where the consumer himself is capable of full cooperation with the producer in the proper selection, application and handling of greases. Only a properly set-up service organization with the tremendous savings it makes possible, can reduce high cost maintenance and operation.

This cannot be accomplished without the advice of technical experts and a well organized lubrication department. All the methods in the world which have been worked out to meet defects of low grade personnel can only be temporary expedients. A definite improvement in personnel from the engineer to the oiler is necessary if the lubrication service is to be effective.

It seems to me that the thing most required is more missionary work to convince the consumer of the importance of the technical details of lubrication.

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Grease Procedures Released By Coordinating Research Council

The Coordinating Research Council has recently released for distribution the following grease test procedures which were developed by the Groups working on C.L.R. Grease Projects:

C.R.C. Designation L-24-745
(U.S. Army Ordnance Spec. AXS-1574)
Test Procedure for Determining Performance Characteristics of Wheel Bearing Lubricants.

C.R.C. Designation L-25-745
(U.S. Army Ordnance Specification AXS-1575)
Evaporation Test Procedure for Low Temperature Greases.

C.R.C. Designation L-26-545
Test Procedure for Determining the Chemical Activity toward Copper of Lubricating Greases.

C.R.C. Designation L-27-545
Modified Test Procedure for the Determination of Dirt in Precision-Instrument Greases.

C.R.C. Designation L-28-545
Test Procedure for the Evaluation of Water Resistance of Lubricating Greases.

C.R.C. Designation L-29-545
Test Procedure for Determination of Low-Temperature Pumpability Characteristics of Lubricants.

Copies of C.R.C. Designation L-24-745 have not yet been printed but will be before February 1, 1946. Interested laboratories can probably secure copies of this procedure from the U. S. Army Ordnance Department under Specification AXS-1574. Copies of the other C.R.C. Procedures itemized above can be procured at a nominal charge from the Coordinating Research Council, 30 Rockefeller Plaza, New York City.

These procedures are made available as research information only, and are not to be construed as a specification or standard, since the Coordinating Research Council, Inc. does not promulgate specifications or standards.

Importance of Lubrication Reflected by Continuing High Number of Fittings

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Contrary to common assumption, the average number of lubrication points on passenger cars has declined but 9.8 points over a period of 12 years. This reduction, from 43.1 on 1931 models to 33.3 on 1942 models, amounts to only 0.816 lubrication points per year. There is an increase of 0.4 lubrication points on 1942 cars over 1941.

The slight reduction explodes the theory held by many persons that automotive design improvements, such as rubber shackles and self-lubricating bearings, have greatly reduced the number of points which the lubrication man must service. Actually, certain automotive designs, as well as introduction of special lubricants, have increased lubrication difficulties.

The following tabulation has been made of lubrication points from 1931 through 1942:

	Average Number Lubrication Points	Greatest Number on Any Car	Lowest Number on Any Car
1931	43.1	62	26
1932	43.6	60	26
1933	40.9	60	25
1934	39.1	55	22
1935	38.8	55	23
1936	38.0	45	24
1937	37.7	48	24
1938	36.4	46	24
1939	34.7	45	21
1940	34.4	48	21
1941	32.9	43	18
1942	33.3	43	18

A study of the tabulation brings up an interesting question: "What causes the increase in average number of lubrication points on 1942 cars over 1941 models?" The answer lies in the lubrication points on Fords, Mercurys, and Plymouths.

On some models of the 1942 Ford 6, Ford V-8 Deluxe and Super Deluxe, and Mercury 8, spring covers with lubrication fittings have been added at front and rear, two at each end. This makes an additional four lubrication points on each model.

18 Points on Nash

The 1942 Plymouth has the Gear Shift Control Bell Crank lubrication fitting not found on the 1941 models.

The 1941 and 1942 tabulations list 18 as the lowest number of lubrication points on any car. This car is the Nash "600," manufactured for the first time in 1941, and now being concentrated upon as the first Nash models of 1946. The other Nash models of 1941-42, 6 and 8, had 40 lubrication points.

The Hudson, with 43 lubrication points, is the car with the greatest number of lubrication points of all 1941 and 1942 makes.

Additions

Knee Action—Although some of the later models using knee action have rubber or pre-lubricated bearings at some points, the number of points requiring lubrication is, on the whole, greater on the average knee action job than on a conventional front end job.

General Motors and Chrysler models introduced knee action in 1934. It is now used on all cars with the exception of Ford, Lincoln, Zephyr, Mercury, Willys, American Bantam and Crosley. In 1940 when Hudson adopted independently suspended front wheels there was an increase of two lubrication points. When Nash swung over at the same time the number of lubrication points for the car was reduced two points because of decreases at other places around the chassis.

Steering Column Gear Shifts—The number of actual lubrication points is not materially increased by this construction. However, there are a number of rods, levers, and joints that require attention with an oil can. Also, in some of the constructions, there are rubber mountings which require the application of a rubber lubricant in order to prevent squeaks.

Metal Spring Covers—The general introduction of this construction over a period of years, either as optional or standard equipment, has added to the number of points to be lubricated on cars so equipped. In some cases springs are provided with rubber or alloy inserts on which lubrication is prohibited. In other cases the encased springs have to be replenished with lubricant from time to time; this is taken care of by means of special clamps for use with grease guns.

Reductions

Rubber Mounted Spring Shackles—In the beginning of the period from 1931 through 1942 practically all springs were provided with bolts and shackles of a type that required lubrication. These were either steel bolts operating in bronze bushings or were Tryon shackles, steel against steel. Over a period of a few years beginning with 1931, model after model adopted rubber mounting of spring ends. In following through the designs, it is sometimes found that a manufacturer will adopt rubber mountings at the front ends of rear springs, while the rear shackles require lubrication.

In a following year the rubber mountings will be continued at the front end, one of the shackle bolts at the rear will be mounted in rubber, and the other will require lubrication. The following year the manufacturer may adopt rubber for all points, thus eliminating entirely any lubrication points at the spring ends themselves.

Needle Type Universal Joints—The use of this type of joint began shortly after 1932 and in a few years was used at least in part by practically all car makers. It was generally assumed at first when needle type universal joints were put on propeller shafts that they had sufficient lubricant in them at assembly to last the life of the car. Early instructions for universal joints were so worded. This naturally reduced the number of points to be lubricated on such models.

Service experience in the course of the next couple of years, however, indicated that the joints would not give greatest satisfaction without further attention. Therefore, recommended mileages for disassembly, cleaning, and repacking were included in manufacturers' recommendations. These mileages started at 30,000 and, in some cases, were reduced to periods as low as 10,000 miles. Thus, such units which were at one time eliminated as lubrication points, have come into the picture again, although they do not have to be lubricated as frequently as the older type universal joints.

Hydraulic Brakes—Although brake shoes themselves have no definite lubrication points, car models using mechanical brakes previous to 1932 or 1933 often had as many as 8 or 10 lubrication points on the various rocker shafts which were attached to the rear axle, drive shaft, etc. Hydraulic brakes, of course, eliminated all lubrication points on the brake mechanism with the possible exception of the brake pedals.

In spite of this, parking brake systems of the mechanical type were retained by all

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General Motors units and all Ford units when they went over to the hydraulic brakes in the period between 1933 and 1939 and some lubrication points remain on most of these models for servicing of these brakes.

Coil Springs—Oldsmobile and Buick models have used these in recent years and, of course, this serves further to reduce the number of points of lubrication since no lubrication whatsoever is required on coil springs.

Increased Difficulties

Despite the fact that the number of lubrication points on passenger cars has decreased slightly, difficulties in lubricating automobiles have increased.

Inaccessibility of lubrication points due to extreme lowering of bodies, skirts, fenders, etc. is a marked example of this. In the early part of the period from 1931 to 1942, all lubrication points were easily accessible or holes were provided in the sheet metal work through which a gun could be inserted.

Another handicap for the lubrication man is the newer type hoods—the alligator type and those opening on the top only. Older type hoods completely exposed the engine, but the modern hoods expose little for the lubrication man to operate on, making it necessary for him to reach down into places not easily accessible and in which light conditions are very poor.

The difficulties of the lubrication man also have been increased by the greater number of types and grades of lubricants required to comply with recommendations of car manufacturers.

In 1931 practically all makes of cars could be lubricated with one gear lubricant for both transmission and differential. This was a regular straight gear lubricant—one grade for summer and another grade for winter.

Compare this with the situation today. Now the requirements of various differentials and transmissions include Passenger Car Duty Hypoid Lubricant, Truck Duty Hypoid Lubricant, Mild Extreme Pressure Lubricant, Regular Gear Lubricant, and Motor Oil for automatic transmissions and transmissions equipped with overdrive. These lubricants must be stocked in grades to meet different temperature conditions for winter and summer in different parts of the country.

In addition to the above, there are the special fluids required for Chrysler's Fluid Drive and the Cadillac and Oldsmobile Hydra-Matic transmission, developed in recent years.

Servicing of metal covered springs requires three different types of spring lubricant according to the manufacturers' recommendations.

Squeaks developing at points around rubber mountings, rubber bushings, and rubber bearings are frequently called to the attention of the lubrication man. A special rubber lubricant is required.

In addition to the rubber parts around the chassis which develop squeaks from time to time, there also are body parts that require lubrication with either a rubber lubricant, a lubrication stick, or an oil can.

All of these special lubricants necessitate increased stocks of materials, and apparatus with which to apply them.

In spite of these difficulties in lubricating automobiles of later years, the average price asked by the service stations for a lubrication job is less than the price asked in 1931. All told, car owners are getting much more for their money today in a lubrication job than they did in 1931 insofar as workmanship and materials are concerned.

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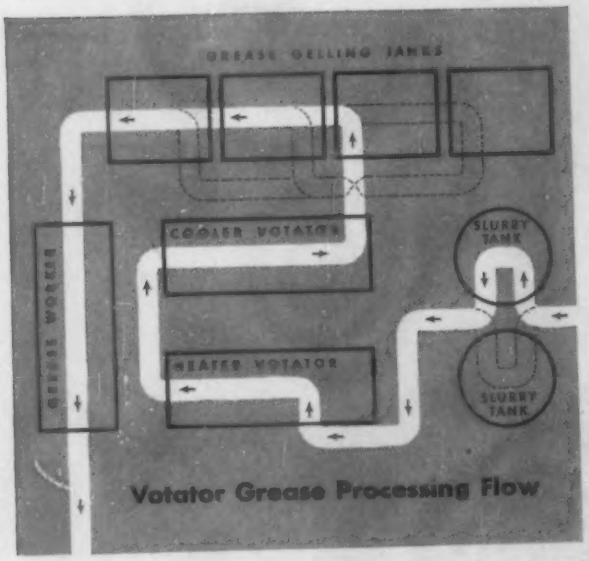

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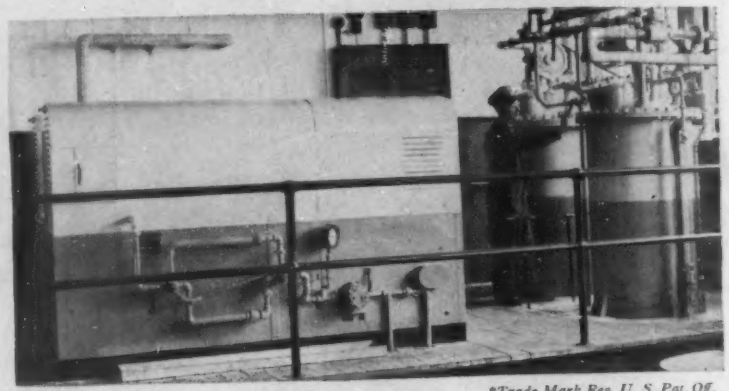

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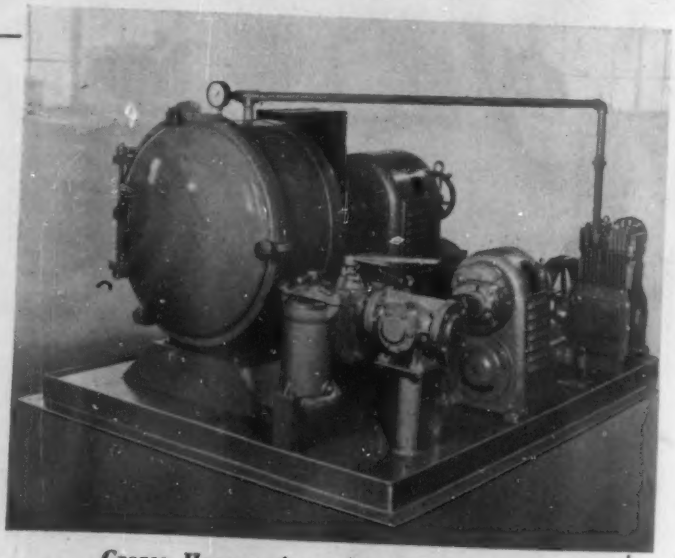

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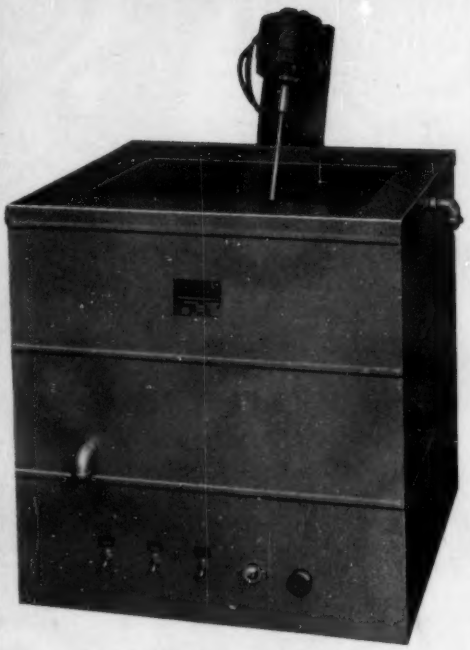

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